REMARKS

I. Introduction

In response to the Office Action dated March 25, 2004, no claims have been cancelled, amended or added. Claims 1-23 remain in the application. Re-examination and re-consideration of the application is requested.

II. Prior Art Rejections

In paragraph (3) of the Office Action, claims 1-6, 8, 9, 11-13, and 16-23 were rejected under 35 U.S.C. §102(b) as being anticipated by St. Ville, U.S. Patent No. 5,594,651 (St. Ville). In paragraph (16) of the Office Action, claims 10, 11, 19, and 23 were rejected under 35 U.S.C. §103(a) as being unpatentable over St. Ville in view of Roth, U.S. Patent No. 5,289,567 (Roth). In paragraph (19) of the Office Action, claims 14 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over St. Ville in view of Itoh et al., U.S. Patent No. 5,774,124 (Itoh).

Applicants' attorney respectfully traverses the rejections in light of the following arguments.

The present invention concerns the field of integrating FEA functions into a CAD program in order to obtain a unified design environment.

A CAD program with integrated FEA functions was known under the trademark "Genius Desktop 3" before the filing date of the present application. As discussed in the paragraph bridging pages 2 and 3 of the application, the "Genius Desktop 3" product makes it possible to perform FEA for any three-dimensional body that has been defined using the underlying CAD functionality. However, there are limitations with respect to the definition of load and support conditions. In the "Genius Desktop 3" product, it is only possible to define forces and fixed and movable supports that act on individual points or along edges or on whole faces of a body.

These limitations restrict the kind of situations that can be modeled conveniently. Consider the example that a user wants to model the mechanical properties of a table on which a drinking glass has been placed. The weight of the drinking glass only acts on the (usually circular) region where the glass contacts the table. It would be rather difficult, time-consuming and error-prone to model this situation in the "Genius Desktop 3" product.

The present invention as recited in independent claims 1, 16 and 20 has the important feature that a graphical function of the CAD program can be used to define a region within a face of a body, the region being used to define a load/support condition for an FEA calculation. The intended meaning of the terms "body" and "face" is the same as in the Boundary Representation

Model, which is usually employed in connection with CAD technology. Examples of the use of these terms (as well as of the use of the term "edge") are shown in Fig. 6, Fig. 7b and Fig. 7c of the present application.

Making use of the above feature of the present invention, the situation of a drinking glass standing on a table can be modeled conveniently. The table is the body, and the upper face of the table plate is the face in the terminology of claims 1, 16 and 20. A graphical CAD function is used to define the region where the glass contacts the table within the face. For example, this graphical CAD function may simply be a function of drawing a disk onto the table face, or it may be a function of projecting a model of the glass onto the face. Then a load condition may be defined for the region within the face by stating that, e.g., a load of 1 Newton (representing the weight of the glass) acts on the entire defined region. The corresponding FEA calculations will then be performed.

St. Ville (U.S. Patent 5,594,651) discloses a method for manufacturing an object wherein CAD techniques are used and an FEA stress analysis is performed. The teaching of St. Ville primarily concerns the finding of proper materials and manufacturing parameters for obtaining the desired properties of the object. Aspects that concern the present invention, namely the integration of FEA functions into a CAD program, are not mentioned.

In particular, St. Ville does not disclose the feature that a graphical function of the CAD program can be used to define a region within a face of a body, the region being used to define a load/support condition for an FEA calculation.

With respect to this feature, section 4 of the Office Action only refers to column 13, lines 55 - 56, and to boxes 11 and 12 in Fig. 1 of St. Ville. However, it is apparent that the disclosure of St. Ville as indicated in the Office Action falls short of what is claimed in the present application. The sentence in column 13, lines 55 - 56 only says that a CAD program is used for generating a geometrical model definition. It does not say that any entity defined by the CAD program - let alone a region within a face - can be used to define a load/support condition for an FEA calculation. Likewise, boxes 11 and 12 in Fig. 1 only say that initial design geometry is defined, and forces applied to an object are identified. Neither box 12 of Fig. 1 nor the corresponding description in column 1, lines 48 - 50 say that graphical functions of the CAD program are used in any way for defining FEA load/support conditions.

In fact, St. Ville not only fails to disclose the above feature of the present invention, but rather teaches away from the present invention. According to column 1, lines 48 - 50 of St. Ville, the "points and direction of application of the respective forces are identified at step 12". This

disclosure seems to indicate that only forces acting on individual points may be defined in the system of St. Ville. This is also shown in Fig. 5A. (As an aside, Fig. 4A and 4B do not represent any force patterns that are modeled in the FEA calculations, but they show the actual forces - not the modeled forces - that occur during a one-leg stance and when rising from a chair, respectively. See column 6, lines 19 - 21). Summing up, it would therefore appear that it is not possible in the system of St. Ville to define a load/support condition that acts on a region within a face of a body.

The above opinion is also supported by those portions of St. Ville that have not been cited in the Office Action. According to the disclosure in column 9, lines 1 - 59, different programs are employed for the CAD and FEA steps, respectively. While the FEA software uses the geometric model data generated by the CAD program, there is no indication that any graphical CAD function may be used to define a load/support condition. The same conclusion can also be drawn from the description of Fig. 8 from column 13, line 53 to column 14, line 22.

Column 10, lines 28 - 30 state that "the finite element model is completed by specifying the values and/or directions of the above-described fields {f} and potentials {x} at the nodes of the discretized object". Again, this confirms that (1) the load/support conditions are defined during the FEA steps on the finite element model data (and not during the CAD steps on the geometric model data), (2) no graphical CAD function is used for defining the load/support conditions, and (3) only forces acting on points (and not forces acting on regions within faces) may be defined.

All in all, the disclosure of St. Ville is much farther away from the present invention than, e.g., the functions that have already been available in the "Genius Desktop 3" product. It is not seen how St. Ville could be detrimental to the allowability of the present claims.

Roth (U.S. Patent No. 5,289,567) and Itoh (U.S. Patent No. 5,774,124) have only been cited in the Office Action with respect to some of the dependent claims. Both of these documents concern FEA calculations. There is no disclosure in these documents of using graphical CAD functions for defining FEA load/support conditions, let alone for defining a load/support condition that refers to a region within a face of a body processed by a CAD program.

Thus, Applicants submit that independent claims 1, 16, and 20 are allowable over St. Ville, Roth, and Itoh. Further, dependent claims 2-15, 17-19, and 21-23 are submitted to be allowable over St. Ville, Roth, and Itoh in the same manner, because they are dependent on independent claims 1, 16, and 20, respectively, and thus contain all the limitations of the independent claims. In addition, dependent claims 2-15, 17-19, and 21-23 recite additional novel elements not shown by St. Ville, Roth, and Itoh.

III. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited. Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicants' undersigned attorney.

Respectfully submitted,

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